Claims

1. Isolated cells comprising nanopatch sensors integrated into the cell membrane thereof, wherein said sensors are provided in the form of perturbation-sensitive constructs, and wherein said perturbation-sensitive constructs respond to perturbations of the cell membrane by means of a detectable change in one or more physical or chemical properties associated with said construct.

2. The isolated cells according to claim 1, wherein the perturbation-sensitive construct comprises a polymer associated with one or more lipid components.

3. The isolated cells according to claim 2, wherein the polymer is polydiacetylene (PDA).

4. The isolated cells according to claim 3, wherein the PDA is a polymer of 10,12-tricosadionic acid, and the lipid components are selected from the group consisting of dimyristoylphosphatidylglycerol, dimyristoylphosphatidylcholine and dimyristoylphosphatidylethanolamine.

5. The isolated cells according to claim 1, wherein the detectable change in the physical or chemical properties associated with the perturbation-sensitive constructs is a change in the visible range absorption spectrum of said cells.

6. The isolated cells according to claim 1, wherein the detectable change in the physical or chemical properties associated with the perturbation-sensitive constructs is a change in the fluorescent emission spectrum of said cells.

7. A process for producing living cells comprising the aforementioned nanopatch sensors according to claim 1, wherein said process comprises the steps of preparing an aqueous solution comprising the perturbation-sensitive construct, or precursors thereof, and co-incubating a suspension of said living cells with said construct or construct precursors, such that said construct becomes integrated into the cell membrane of said living cells.

8. The process according to claim 7, wherein the perturbation-sensitive construct comprises a polymerizable material associated with one or more lipid components, and said process further comprises polymerization-inducing short ultraviolet irradiation of the said construct following co-incubation with the living cells.

9. The process according to claim 8, wherein the polymerizable material is a monomer that may be polymerized to form PDA.

10. The process according to claim 9, wherein the monomer is 10,12-tricosadionic acid, and the lipid components are selected from the group consisting of dimyristoylphosphatidylglycerol, dimyristoylphosphatidylcholine and dimyristoylphosphatidylethanolamine.

11. A method for detecting and/or measuring agents and conditions that cause perturbations in the cell membranes of living cells, wherein said method comprises the steps of providing isolated nanopatch sensor-containing cells according to claim 1, exposing said nanopatch sensor-containing cells to a known or putative perturbation-inducing agent or condition, and detecting and/or measuring one or more changes in the physical or chemical properties associated with said nanopatch sensors.

12. The method according to claim 11, wherein the perturbation-sensitive construct contained within the nanopatch sensors comprises a polymer associated with one or more lipid components.

13. The method according to claim 12, wherein the polymer is PDA.

14. The method according to claim 13, wherein the PDA is a polymer of 10,12-tricosadionic acid, and the lipid components are selected from the group consisting of dimyristoylphosphatidylglycerol, dimyristoylphosphatidylcholine and dimyristoylphosphatidylethanolamine.

15. The method according to claim 14, wherein the change in the physical or chemical properties associated with said nanopatch sensors to be detected and/or measured is a change in the visible range absorption spectrum of said sensors.

16. The method according to claim 15, wherein the change in the physical or chemical properties associated with said nanopatch sensors to be detected and/or measured is a change in the fluorescent emission spectrum of said sensors.

17. The method according to any one of claims 11 to 16, wherein the perturbations comprise changes in the three-dimensional conformation of the cell membrane.

18. The method according to any one of claims 11 to 16, wherein the perturbations comprise changes in the function of the cell membrane.

19. The method according to any one of claims 11 to 16, wherein the perturbations are caused by biochemical processes occurring at the cell membrane surface, and wherein said processes do not cause any significant structural or functional changes within said cell membrane.

20. Isolated prokaryotic cells comprising nanopatch sensors integrated into the cell wall and/or cell membrane thereof, wherein said sensors are provided in the form of perturbation-sensitive constructs, and wherein said perturbation-sensitive constructs respond to perturbations of the cell wall and/or of the underlying cell membrane by means of a detectable change in one or more physical or chemical properties associated with said construct.

21. The isolated prokaryotic cells according to claim 20, wherein the perturbation-sensitive constructs comprise a PDA polymer associated with one or more lipid components selected from the group consisting of dimyristoylphosphatidylglycerol, dimyristoylphosphatidylcholine and dimyristoylphosphatidylethanolamine.

22. The isolated prokaryotic cells according to claim 20, wherein the detectable change in the physical or chemical properties associated with the perturbation-sensitive constructs is a change in the visible range absorption spectrum of said cells.

23. The isolated prokaryotic cells according to claim 20, wherein the detectable change in the physical or chemical properties associated with the perturbation-sensitive constructs is a change in the fluorescent emission spectrum of said cells.

24. A process for producing living prokaryotic cells comprising the aforementioned nanopatch sensors according to claim 20, wherein said prokaryotic cells have a cell wall as their outer layer, and wherein said process comprises the steps of preparing an aqueous solution comprising the perturbation-sensitive construct, or precursors thereof, and co-incubating a suspension of said living cells with said construct or construct precursors, such that said construct becomes integrated into the cell wall and/or cell membrane of said cells.

25. The process according to claim 24, wherein the perturbation-sensitive construct comprises a polymerizable material associated with one or more lipid components, and said process further comprises polymerization-inducing short ultraviolet irradiation of the said construct following co-incubation with the living cells.

26. The process according to claim 25, wherein the polymerizable material is 10,12-tricosadionic acid, and the lipid components are selected from the group consisting of dimyristoylphosphatidylglycerol, dimyristoylphosphatidylcholine and dimyristoylphosphatidylethanolamine.

27. A method for detecting and/or measuring agents and conditions that cause perturbations in the cell walls and cell membranes of living cell-wall containing prokaryotic cells, wherein said method comprises the steps of providing isolated nanopatch sensor-containing cells according to claim 20, exposing said nanopatch sensor-containing cells to a known or putative perturbation-inducing agent or condition, and detecting and/or measuring one or more changes in the physical or chemical properties associated with said nanopatch sensors.

28. The method according to claim 27, wherein the perturbations comprise changes in the three-dimensional conformation of the cell wall and/or cell membrane.

29. The method according to claim 27, wherein the perturbations comprise changes in the function of the cell wall and/or cell membrane.

30. The method according to claims 27, wherein the perturbations are caused by biochemical processes occurring at the cell wall surface and/or cell membrane surface, and wherein said processes do not cause any significant structural or functional changes within said cell wall and/or cell membrane.